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U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

**TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371**

000515-141

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5)

Unassigned **09/194700**

INTERNATIONAL APPLICATION NO.

PCT/SE98/00187 ✓

INTERNATIONAL FILING DATE

3 February 1998 ✓

PRIORITY DATE CLAIMED

4 February 1997 ✓

TITLE OF INVENTION

**ABSORBENT ARTICLE HAVING IMPROVED SURFACE PROPERTIES**

APPLICANT(S) FOR DO/EO/US

Urban WIDLUND ✓

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and the PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☒ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.  
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:

INTERNATIONAL SEARCH REPORT and PETITION TO REVIVE

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.50)  
Unassigned

INTERNATIONAL APPLICATION NO.  
PCT/SE98/00187

ATTORNEY'S DOCKET NUMBER  
000515-141

17. ☒ The following fees are submitted:

CALCULATIONS

PTO USE ONLY

**Basic National Fee (37 CFR 1.492(a)(1)-(5)):**

Search Report has been prepared by the EPO or JPO ..... \$840.00  
International preliminary examination fee paid to USPTO (37 CFR 1.482)  
..... \$670.00  
No international preliminary examination fee paid to USPTO (37 CFR 1.482)  
but international search fee paid to USPTO (37 CFR 1.445(a)(2)) ..... \$760.00  
Neither international preliminary examination fee (37 CFR 1.482) nor  
international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$970.00  
International preliminary examination fee paid to USPTO (37 CFR 1.482)  
and all claims satisfied provisions of PCT Article 33(2)-(4) ..... \$96.00

**ENTER APPROPRIATE BASIC FEE AMOUNT =**

\$ 970.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30  
months from the earliest claimed priority date (37 CFR 1.492(e)).

\$

Claims

Number Filed

Number Extra

Rate

Total Claims 15 -20 = 0 X\$18.00

\$ 0

Independent Claims 1 -3 = 0 X\$78.00

\$ 0

Multiple dependent claim(s) (if applicable) + \$260.00

\$

**TOTAL OF ABOVE CALCULATIONS =**

\$ 970.00

Reduction for 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be  
filed. (Note 37 CFR 1.9, 1.27, 1.28).

\$

**SUBTOTAL =**

\$ 970.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30  
months from the earliest claimed priority date (37 CFR 1.492(f)).

\$

**TOTAL NATIONAL FEE =**

\$ 970.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied  
by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +

\$

**TOTAL FEES ENCLOSED =**

\$ 970.00

Amount to be:  
refunded

\$

charged

\$

- a. ☒ A check in the amount of \$ 970.00 to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. 02-4800 in the amount of \$ to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-4800. A duplicate copy of this sheet is enclosed.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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SIGNATURE

William C. Rowland  
NAME

30,888  
REGISTRATION NUMBER

December 1, 1998

Claim 5, lines 1 and 2, change "any one of the preceding claims" to --claim 1--.

Claim 6, lines 1 and 2, change "any one of the preceding claims" to --claim 1--.

Claim 7, lines 1 and 2, change "any one of the preceding claims" to --claim 1--.

Claim 8, line 1, change "any one of claims 1-6" to --claim 1--.

Claim 9, line 1, delete "or 2".

Claim 10, line 1, delete "or 2".

Claim 11, lines 1 and 2, change "any one of the preceding claims" to --claim 1--.

Claim 12, lines 1 and 2, change "any one of the preceding claims" to --claim 1--.

Claim 13, lines 1 and 2, change "any one of the preceding claims" to --claim 1--.

**REMARKS**

In the event that there are any questions concerning this amendment, or the application in general, the Examiner is

Application No. Unassigned  
Attorney's Docket No. 000515-141

respectfully urged to telephone the undersigned attorney so  
that prosecution of the application may be expedited.

Respectfully submitted,  
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Date: December 1, 1998

5     ABSORBENT ARTICLE HAVING IMPROVED SURFACE PROPERTIES

TECHNICAL FIELD:

10     The invention pertains to an absorbent article intended for female users, such as a sanitary napkin, a panty-liner, or an incontinence protector, comprising a liquid-pervious surface layer, a liquid-impervious surface layer, and an absorbent body enclosed between the two surface layers, wherein the article further exhibits a wetting region, 15 which is the region of the liquid-pervious surface layer which is intended to first be wetted by body fluid emitted to the article.

BACKGROUND OF THE INVENTION:

20     Certain types of absorbent articles such as sanitary napkins and incontinence protectors for lightly incontinent female users are intended to be worn in close contact against the body of the user. Such an absorbent article is 25 thereby usually applied inside the panties of the user and is kept in contact against the body by the pressure from the panties during use.

30     It is important that the surface of an absorbent article which is intended to be facing the body of the user is soft and comfortable and does not cause irritation. Furthermore, the surface of the article should have the ability to receive the body fluid which is emitted to the article, and rapidly let the liquid pass into the article and be 35 absorbed by it. If the liquid is not admitted into the article sufficiently quickly, the risk is obvious that the liquid instead will flow onto the surface of the article and cause leakage. Furthermore, the surface of the article will become wet and sticky, something which is perceived as 40 extremely unpleasant by a majority of users. A wet surface

may further cause the user inconvenience in the form of skin irritation.

5 In order to avoid wet surfaces on absorbent articles, these are generally provided with a liquid-pervious surface layer of a comparatively hydrophobic material. Examples of such hydrophobic materials are perforated plastic films, plastic  
10 scrims and nonwoven materials of hydrophobic fibres. The term nonwoven material refers to different types of non-woven, bonded fibre layers. Such hydrophobic layers have a very low wettability and are therefore usually treated, for example, with surfactants in order to increase the wettability and the ability to admit liquid through. In spite of this, the acquisition rate of hydrophobic surface  
15 materials is often too low.

The hydrophobic surface layers exhibit a very dry surface, even after wetting. However, small liquid quantities may remain in or on the surface layer after wetting, since the  
20 liquid transportation ability in a hydrophobic surface layer is low. It is true, for instance, that a perforated plastic layer has good liquid transportation ability through the perforations, but liquid which has ended up between the perforations tends to remain on the surface.

25 Remaining liquid in or on the liquid-pervious surface layer constitutes a problem, in particular when the absorbent article is a sanitary napkin, since menstrual fluid has a relatively high viscosity and thereby has a larger  
30 inclination to leave residues on the liquid-pervious cover layer. Such remaining liquid results in the surface of the sanitary napkin becoming wet and sticky, which is a disadvantage both during use and when the sanitary napkin shall be replaced.

Since an absorbent article, such as a sanitary napkin or an incontinence protector, usually is attached inside the panties of the user by adhesive surfaces arranged on the article, the article follows the movements of the panties during use. This implies that the position of the article is changed somewhat in relation to the body of the user when the user moves about. In this way, liquid which has remained on the surface of the article will be smeared out across the surface. The soiled surface bears on the body of the user, something which of course is perceived as unpleasant and insanitary.

Absorbent articles for female users are sometimes provided with a hump, intended to be arranged in the genital region of the user during use, in order to catch body fluid as soon as it leaves the body of the user. Such a hump may thereby completely, or partially, be placed between the labia pudendi of the user, and will thereby come into contact with the mucous membranes inside the labia pudendi. Thereby, it has been found that the, proportionately, very dry surface on a conventional hydrophobic surface layer can cause discomfort in the form of chafing and irritation of the mucous membranes.

By means of the present invention, however, an absorbent article has been achieved with which the problems associated with previously known such articles essentially have been eliminated. Accordingly, by means of an article according to the invention it is possible to offer both a dry surface against the skin of the user, rapid liquid acquisition and minimal irritation of the mucous membranes of the user.

An article designed in accordance with the invention is primarily characterized in that the liquid-pervious surface layer within the wetting region is constituted of a



hydrophilic material, at least at the surface of the layer which is intended to be facing the user during use, and in that the remaining parts of the liquid-pervious surface layer are constituted of a hydrophobic material.

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The hydrophilic portion of the liquid-pervious surface layer may come into contact with the mucous membranes of the user in the genital region during use. Since the hydrophilic material is able to retain moisture, desiccation of the mucous membranes is counteracted.

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Advantageously, the hydrophilic material has a certain absorbency of its own, so that liquid is not only absorbed into the voids of the material, but also into the material itself. For instance, it is suitable to use a fibre material in which at least some of the integral fibres have the ability to absorb liquid into the fibres. Thereby, the risk that the hydrophilic material is entirely drained of liquid by underlying absorption material is non-existent. Accordingly, such an absorbent material will maintain a wet surface bearing on the mucous membranes of the user during use.

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The article, according to the invention, may advantageously be provided with a hump, projecting from the liquid-pervious surface layer, wherein the location of the hump on the article at least partially coincides with the wetting region. By means of arranging a hump at the wetting region, it is ensured that the hydrophilic region of the article is in contact against the mucous membranes of the user during use and prevents desiccation of these. Preferably, the hump is shaped in such a way that it conforms to the body shape of the user in the region in question, whereby the risk of placing the article in the wrong position is minimal. An anatomically correct design of a hump on the article contributes moreover to the article being directed into and

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being kept in the correct position in relation to the genitals of the user.

5 A hump of the herein intended type may, for example, be achieved by means of the absorbent article comprising shaping members which, through the action of the forces which the article is subjected to during use, have the ability to bring the wetting region of the article into contact with the mucous membranes of the user. Such shaping  
10 members may, for example, be constituted of compressions, folding notches or the like, or of a deformable insert.

The hydrophilic material in the liquid-pervious surface layer may, for example, primarily consist of hydrophilic,  
15 absorbent fibres such as cellulose fibres, cotton, rayon, jute, peat moss, or the like. Alternatively, the hydrophilic material in the liquid-pervious surface layer may primarily consist of hydrophilic absorbent foam material, such as polyurethane foam, cellulose foam, or the  
20 like.

The hydrophobic material in the liquid-pervious surface layer may, for example, primarily consist of hydrophobic fibres such as polypropylene fibres, polyethylene fibres,  
25 polyester fibres, or hydrophobic bi-component fibres, or of a hydrophobic foam material, such as polyethylene foam.

Although it is preferred, the liquid-pervious surface layer does not have to be composed of different components, but  
30 may consist of one and the same material layer, which has been treated so that it has different properties within different regions of its surface. Accordingly, the hydrophilic material in the liquid-pervious surface layer may be constituted of a hydrophobic material which has been  
35 rendered hydrophilic. In a corresponding way, the hydrophobic material in the liquid-pervious surface layer

may of course be constituted of a hydrophilic material which has been rendered hydrophobic.

5 A number of different types of treatment for modifying the surface and changing the surface properties of materials for absorption purposes are well-known to the person skilled in the art. The most common way to achieve hydrophilicity for an initially hydrophobic material, is to treat the material with a wetting agent. The largest  
10 disadvantage of treatment with a wetting agent, however, is that the wetting agent gradually is flushed out of the material, whereafter this returns to its initial hydrophobic state. Also other methods for rendering a hydrophobic material hydrophilic are previously known, such  
15 as flame treatment, corona or plasma.

According to one embodiment of the invention, the liquid-pervious surface layer comprises a laminate of a first liquid-pervious, hydrophobic material layer, arranged  
20 closest to the absorbent body, and a second liquid-pervious, hydrophilic material layer of substantially the same extension as the wetting region of the article, and intended to bear on the body of the user in the wetting region during use.

25 According to another embodiment of the invention, the liquid-pervious surface layer comprises a laminate of a first liquid-pervious, hydrophobic material layer, and a second liquid-pervious, hydrophilic material layer arranged  
30 closest to the absorbent body, inside the first material layer, wherein the hydrophobic material layer exhibits an opening of substantially the same extension as the wetting region of the article through which the hydrophilic layer is exposed.

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It is an advantage if the absorbent article is kept in position against the body of the user without being attached to the underwear of the user. The article may thereby, for instance, have such a shape and stiffness that it remains in position against the body of the user without the need for a special attachment member. Suitably designed articles are described in, for example, SE 9604224-7, SE 9604222-1 and SE 9604223-9. Alternatively, the article may be kept in position against the body of the user by means of a girdle, or the like, which is detached from the panties.

Particularly when such articles which initially are essentially planar are concerned, it may be suitable to provide the article with some kind of shaping member which, preferably by means of influence of the forces which the article is subjected to during use, has the ability to bring the wetting region into contact with the mucous membranes of the user. Examples of such shaping members are folding notches, such as compressions or slits, and stiffening inserts, with or without hinge-like portions. Furthermore, it is possible to use different types of elastic means or elements which the user herself bends or forms in another way before use.

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#### BRIEF DESCRIPTION OF THE DRAWINGS:

In the following, the invention will be described with reference to the embodiments shown in the attached drawings, in which:

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Fig. 1 shows a sanitary napkin according to a first embodiment of the invention;

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Fig. 2 shows a section along the line II-II through the sanitary napkin in Fig. 1,

- Fig. 3 shows a sanitary napkin according to a second embodiment of the invention,
- 5 Fig. 4 shows a section along the line IV-IV through the sanitary napkin in Fig. 3,
- Fig. 5 shows a sanitary napkin according to a third embodiment of the invention and
- 10 Fig. 6 shows a section along the line VI-VI through the sanitary napkin in Fig. 5.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS:

- 15 The sanitary napkin 1 shown in Figs. 1 and 2 comprises a liquid-pervious surface layer 2 arranged on the side of the sanitary napkin which is intended to be facing the user during use, a liquid-impervious surface layer 3 arranged on the side of the sanitary napkin which is intended to be facing away from the user during use, and an absorbent body 4 enclosed between the two surface layers. The two surface layers have essentially the same shape as the absorbent body 4, but a slightly larger extension in the plane, whereby they form a protruding edge 5 around the entire periphery of the absorbent body 4 . The surface layers are mutually connected within the protruding edge 5, for example by gluing, sewing, or welding by means of heat or ultrasonics.
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- 25
- 30 The liquid-impervious surface layer 3 is of a conventional type and may, accordingly, consist of any liquid-impervious material suitable for the purpose. Examples of such materials are different types of thin plastic films or nonwoven materials which have been treated in order to resist liquid penetration, for example by means of coating with plastic, wax, or the like. The liquid-impervious
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surface layer 3 may further be constituted of a liquid-impervious surface on the absorbent body 4.

5 The absorbent body 4 consists of one or several layers of absorbent material such as cellulose fluff pulp, absorbent bonded fibre layers, tissue layers, absorbent foams, peat moss, or the like. The absorbent body may further contain  
10 superabsorbent polymers, i.e. polymers with the ability to absorb several time their own weight of liquid during the formation of liquid-containing gel. Superabsorbents are usually present in the form of particles, flakes, fibres, granules, or the like. The superabsorbent material may occur alone, or in combination with other absorbent material.

15 The sanitary napkin 1 is hourglass-shaped with wider end portions 6, 7 and a narrower crotch portion 8 between the end portions 6, 7. The sanitary napkin 1 further exhibits two longitudinal, concavely-curved side edges 9, 10 and two  
20 transverse convexly-curved end edges 11, 12.

An attachment member 13, in the form of a region of self-adhesive glue, is arranged on the outside of the liquid-impervious cover layer 3 at each end portion 6, 7 of the  
25 sanitary napkin 1. During use, the sanitary napkin 1, this is applied inside the panties of the user and is attached to the panties by means of the attachment member 13. Before use, the attachment member 13 is protected in a conventional way, for example by means of being covered by  
30 a protective layer of paper or plastic which has been treated with silicone, or embossed in order to be easily detachable from the glue when the sanitary napkin is to be used. Alternatively, the glue may of course be arranged in any pattern suitable for the purpose such as longitudinal  
35 strands, complete coverage, or the like. Furthermore, other types of attachment members may be used, such as frictional

coverings, snap fasteners, clamps, attachment flaps, or the like.

5 The liquid-pervious surface layer 2 consists of a first layer 14 of conventional, hydrophobic liquid-pervious material. The first layer 14 is applied over the surface on the absorbent body 4 which is intended to be facing the user during use. Examples of hydrophobic surface materials are perforated plastic films, hydrophobic nonwoven materials, plastic scrims, or the like. A hydrophobic surface material admits liquid through to the underlying absorbent body 4. Since the absorbent body is more hydrophilic than the material in the first layer 14, the first layer 14 is almost completely drained of liquid after wetting. For this reason, and since the first layer 14 essentially lacks absorbency, the layer 14 remains dry even after wetting. Only a very small liquid quantity may remain on or inside the first layer 14.

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20 During use, the sanitary napkin 1 is applied in the genital region of the user, with the crotch portion 8 of the sanitary napkin located at the urethra opening and the vaginal opening of the user. By means of this, emitted body fluid will hit the sanitary napkin 1 within a limited area on the sanitary napkin, the so-called wetting region 15. Within the wetting region 15, the liquid-pervious surface layer 2 exhibits a second, hydrophilic and absorbent layer 16. Thereby, examples of suitable, hydrophilic materials are absorbent, bonded cellulose layers, nonwoven materials and woven, knitted or crocheted textile materials, entirely or primarily consisting of hydrophilic fibres such as cotton, cellulose, rayon, peat moss, or the like. Since the hydrophilic material may come into contact with the mucous membranes in the genital region of the user during use, it is extremely important that the material is skin-friendly

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and does not contain any component which may cause allergic reactions, or other troubles.

- 5 Instead of using a special hydrophilic layer 16, it is of course possible to achieve a hydrophilic region by means of treating the first, hydrophobic layer 14 with a wetting agent, or any other type of surface-modifying treatment within the wetting region 15 of the sanitary napkin. Thereby, it is essential that the treated region has the ability to retain at least a small liquid quantity after wetting so that the mucous membranes of the user are kept moist when they are in contact with the wetting region 15 of the sanitary napkin.
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- 15 The second layer 16 may come into contact with the sensitive mucous membranes inside the labia pudendi of the user during use. Since the second layer 16 is hydrophilic and absorbent, there is no risk of desiccation of the mucous membranes, since part of the liquid which is absorbed by the sanitary napkin will stay in the second layer 16. Thereby, the mucous membranes are kept moist during use, and the risk of chafing and other irritation of the mucous membranes is almost entirely eliminated. Furthermore, the risk of liquid flowing onto the surface of the article before it is absorbed into the article is very small, since the hydrophilic, second layer 16 has high wettability and immediately catches and absorbs emitted body fluid.
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- 25
- 30 In contrast to the mucous membranes, the skin of the user in the genital region should be protected against wetting. Within the portions of the surface of the sanitary napkin 1 which are in contact with the skin of the user during use, therefore only the hydrophobic first layer 14 is present. Thereby, a high dryness against the skin is achieved, and irritation of the same is avoided.
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During normal use of the sanitary napkin, i.e. at moderate liquid flows and on condition that the sanitary napkin is correctly positioned in relation to the body of the user, the first surface layer 14 will not primarily be wetted by liquid. The liquid which is emitted will instead first hit the second hydrophilic layer 16 and thereafter be absorbed further into the the absorbent body 4 where the liquid is distributed. Because of its low wettability, the first, hydrophobic layer 14 serves as a barrier against passage of liquid back out from the sanitary napkin. This implies that also a sanitary napkin which has absorbed a relatively large amount of liquid feels dry against the skin in the regions which surround the wetting region 15 of the sanitary napkin.

Another advantage with arranging the hydrophobic layer 14 inside the hydrophilic layer 16 is that the transport into the absorbent body 4, of the liquid which is emitted to the sanitary napkin, is braked by the hydrophobic layer 14. This implies that the effect of the outer, hydrophilic layer 16 is magnified, since liquid more easily remains in this layer and is not drained into the absorbent body as easily as if the hydrophilic layer 16 had been in direct contact with the absorbent body 4.

In Figs. 3 and 4 another sanitary napkin 301 is shown, with the same basic construction as the sanitary napkin 1 shown in Figs. 1 and 2. Accordingly, the sanitary napkin in Figs. 3 and 4 exhibits a liquid-pervious surface layer 302, a liquid-impervious surface layer 303, and an absorbent body 304 enclosed between the surface layers 302, 303. The surface layers 302, 303 are mutually connected within an edge portion 305, protruding around the absorbent body 304.

The absorbent body 304 consists of two parts, of which a first part 304' is located closest to the liquid-impervious

surface layer 303, and a second part 304'' forms a longitudinal hump 317, which extends along the longitudinal centre line 318 of the sanitary napkin.

5 The liquid-pervious surface layer 302 consist of two parts, of which the first part is constituted of a first layer 314, which is hydrophobic and essentially lacks absorbency of its own. The second part is constituted of a second  
10 layer 316 which is hydrophilic, with a certain absorbency of its own. The second layer 316 is arranged at the wetting region 315 of the sanitary napkin which coincides with a longitudinal central portion of the hump 317. Since the hump 317 is intended to penetrate a small distance in between the labia pudendi of the user during use and  
15 separate these a little, the wetting region 315 will be in contact with the mucous membranes inside the labia pudendi during use. For this reason, it is important that the surface layer 302 of the sanitary napkin in the wetting region 315 is not so dry that the hump 315 chafes or in  
20 another way irritates the mucous membranes.

The presence of the hump 317 is extremely advantageous, since the hump 317 improves the fit of the sanitary napkin and makes it possible to almost exactly predict which  
25 region which will bear on the mucous membranes of the user during use. Thereby, it is possible to restrict the hydrophilic portion of the surface of the sanitary napkin solely to this region, and thereby to achieve a sanitary napkin with a surface which otherwise is dry and pleasant  
30 against the skin of the user. In this respect it is of no significance if the hump is preformed, such as shown in Figs. 3 and 4, or is formed during use by means of the absorbent article comprising some type of shaping member which, through the influence of the forces which arise  
35 during use, guides the formation of a hump on the surface of the article.

The sanitary napkin lacks a special attachment member, since the pressure from the panties of the user, together with the hump bearing closely on the body, implies that the sanitary napkin is displaced comparatively little in relation to the body of the user during use. However, it is possible to provide the sanitary napkin with any known type of attachment member, if this is found to be desirable. However, attachment members which keep the sanitary napkin against the body independently of the movements of the underwear of the user are preferred.

The sanitary napkin 501 shown in Figs. 5 and 6 has a construction which is somewhat different from the construction of the earlier described sanitary napkins 1, 301. The sanitary napkin 501 comprises a liquid-pervious surface layer 502 and a liquid-impervious surface layer 503, which together enclose an absorbent body 504. The liquid-impervious surface layer 503 is constituted of a thick, rigid plastic layer, which forms a hard, shape-permanent shell onto which the absorbent body 504 is arranged.

The sanitary napkin 501 is shaped with a front portion 506, which is wider than the rear portion 507, and with a crotch portion 508 which is narrower than both the front portion and the rear portion. Since the liquid-impervious cover layer 503 is so rigid, it is essential that the sanitary napkin has a shape which to a very high extent is adapted to the anatomy of the user. Thereby, it is of particularly great significance that the width of the sanitary napkin, at least within a portion of the crotch portion 508, does not exceed 30-35 mm, or is compressible to approx. 30-35 mm. It has, namely, been found that there is a critical area in the groin area of all users where the distance between the muscles travelling down along the thighs is approximately 30-35 mm. A very rigid sanitary napkin with

a width which exceeds the distance between the muscles in the critical area, will press and chafe against the inside of the legs of the user during use. Therefore, it is essential that at least part of the crotch portion 508 has a width which without any discomfort can be accommodated in the critical area.

The sanitary napkin 501 further exhibits two longitudinal side edges 509, 510, a transverse concavely-curved front edge 511 and a transverse, convexly-curved rear edge 512. The sanitary napkin is shaped in such a way that, in the front part of the crotch portion 508, there is a cross-sectional line 524, extending in the transverse direction of the sanitary napkin, which intersects the side edges 109, 110 of the sanitary napkin, wherein the side edges 109, 110 change inclination in relation to the longitudinal centre line 518 of the sanitary napkin at the cross-sectional line 524. The width of the sanitary napkin increases in a direction from the cross-sectional line 524 towards the front edge 511, whereby the front portion 506 exhibits a maximum width which exceeds the width of the crotch portion 508 at the cross-sectional line 524. Thereby, the maximum width of the front portion 506 is at least twice the width of the crotch portion 508 at the cross-sectional line 524. The inclination of the side edges 509, 510 at the front portion 506 is defined by an angle  $\beta$  between each respective side edge 509, 510 and a longitudinal line parallel to the centre line 523, wherein  $\beta$  is between  $30^\circ$  and  $90^\circ$  and wherein the width of the crotch portion 508 at the cross-sectional line 524 is between 15 and 45 mm and preferably between 20 and 40 mm.

The absorbent body 504 comprises a first part 504', which forms a longitudinal hump 517 on the side of the sanitary napkin which is intended to be facing a user during use. The first part 504' consists of several layers of a

material with high absorbency, stacked onto each other, wherein the size of the layers decreases in a direction towards the top of the hump 517. Thereby, the hump 517 obtains an anatomically correct shape, tapering towards the top. An absorption material, particularly suited for the purpose, is the fibre material which is disclosed in WO 94/10953 and WO 94/10956. These materials occur in the form of dry-laid fibre layers, having high density and stiffness, and are use directly in an absorbent article without first being defibered. A hump built up from such material has high stiffness and good ability to resist pressure deformation, whereby the central hump 517 exhibits an excellent shape permanence. Furthermore, the fibre material has a high absorption capacity. During absorption, the material swells slightly in the thickness direction, and the hump thereby conforms to the available space in the genital region of the user. An advantage with this is that the hump 517 adopts a shape which is uniquely adapted to each user. In this way, both the leakage security and the user comfort are increased.

It is of course possible to use other types of absorption materials, such as absorbent foams, or absorbent fibres such as cellulose fluff pulp, rayon, peat moss, cotton or the like with or without superabsorbent material. All conceivable combinations and mixtures of absorbent materials can be used. Furthermore, it is not necessary that the first part 504' of the absorbent body 504 is constituted of the shown layer structure. Accordingly, the first part 504' may consist of a single piece of absorption material, for example a foam, or a formed fibre wadding, or material layers placed in the height direction, rolled up, or the like.

The absorbent body 504 of the sanitary napkin 501 further comprises an absorption layer 504'', arranged over the hump

517, between this and the liquid-pervious surface layer 502. The absorption layer 504'' consists of a hydrophilic material with good coherence, and with the ability to rapidly acquire and absorb body fluid. Useful absorption materials are for example hydrophilic, absorbent nonwoven materials, tissue layers, or air-laid, bonded cellulose layers. Such materials rapidly absorb liquid and retain part of the liquid inside the material, so that this remains moist or wet after wetting.

10 The hydrophobic, liquid-pervious surface layer 502 is provided with an opening 520 at the wetting region 515 of the sanitary napkin. Thereby, the absorption layer 504'', located inside the liquid-pervious surface layer 502, is exposed through the opening. During the use of the sanitary napkin 501, emitted body fluid will be absorbed directly by the absorption material in the absorption layer 504'' at the wetting region 515. In this way, it is prevented that liquid flows out onto the liquid-pervious surface layer 502 of the sanitary napkin and causes leakage.

Furthermore, it is avoided that liquid remains in the surface layer 502 and is smeared out across the surface and the body of the user. Since the second part 504'' of the absorbent body has the ability to absorb liquid, this implies that liquid which is emitted to the surface of the layer is absorbed into the layer 504'' instead of being left on the surface. By means of absorbing body fluid, the absorption layer 504'' becomes wet, or moist, since part of the liquid is retained in the layer. Thereby, the absorption layer 504'' exhibits a moist, or wet surface bearing on the body of the user in the wetting region 515. As earlier mentioned, this is a significant advantage since the upper part of the hump 517 of the sanitary napkin 501 reaches in between the labia pudendi of the user and comes into contact with the sensitive mucous membranes in the

genital region of the user, are thus protected against desiccation and irritation.

5 In the sanitary napkin shown in Figs. 5 and 6, the shape of the sanitary napkin is maintained by means of the entire liquid-impervious surface layer 503 being constituted by a shape permanent shell for the absorbent body 504 of the sanitary napkin. Thereby, the front portion 506 of the sanitary napkin is upwardly angled in relation to the  
10 crotch portion 508 of the sanitary napkin in order to conform to the curvature across the mons veneris of the user. The bending upwards is not done along a sharp folding line, but the curvature is continuous in the longitudinal direction of the sanitary napkin. Thereby, the front  
15 portion 508 of the sanitary napkin forms a softly rounded bowl which conforms very well to the anatomy of the user.

Fig. 6 shows a cross-section through the sanitary napkin 501, shown in Fig. 5. As is clearly evident from Fig. 6,  
20 the side edges 509, 510 of the sanitary napkin are bent in a direction downwards-inwards, seen from the liquid-pervious surface layer 502. This implies that the sanitary napkin, along the side edges 109, 110, exhibits rounded ridges 525, 526 which during the use of the sanitary napkin  
25 are intended to bear on the body of the user, in the groin folds of the user. The rounded ridges 525, 526 extend along the side edges 509, 510 along almost the entire length of the sanitary napkin, but level somewhat at the front edge 511 and the rear edge 512, respectively.

30 In order to further increase the comfort to the user, the front portion 506 is provided with a recess 522 at the front edge 511. The recess 522 is formed by means of the front edge 511 being curved in a direction inwards, towards  
35 the crotch portion 508 of the sanitary napkin. Since the front edge 508 is concavely-curved, it follows the outline

of the mons veneris of the user in a better way, whereby the risk of chafing is almost non-existent.

5 The body-adapted, anatomically correct shape of the sanitary napkin, means that the sanitary napkin is kept safely and comfortably in position during use, without the need for special attachment members. Several factors influence the good attachment, such as the shape and the location of the hump, the two-dimensional shape of the  
10 sanitary napkin which is adapted to the available space between the legs of the user and which prevents the sanitary napkin from sliding backwards during use, the stiff, shape-permanent liquid-pervious layer, and the longitudinal curvature according to the curvature on the  
15 body of the user. Because of the anatomically adapted shape, the sanitary napkin will always be correctly positioned in relation to the body of the user during use, so that the absorbent material in the wetting region 515 of the sanitary napkin always will be the portion of the  
20 sanitary napkin which first is subjected to wetting, and which bears on the mucous membranes of the user during use. The parts of the sanitary napkin which are in contact with the skin of the user during use, on the other hand, are covered by the hydrophobic surface layer 502, which ensures  
25 that the skin is kept dry during use. A contributing reason for this is that the surface layer 502 prevents rewetting by liquid which has been absorbed into the absorbent body 504 of the sanitary napkin.

30 The invention should not be regarded as being limited to the herein described embodiments, but a number of further variants and modifications are conceivable within the scope of the claims. For instance, the invention includes all types of absorbent articles for female users, which  
35 articles have a part which during use may come into contact with the mucous membranes of the user in the genital



region, and a part which is in contact with skin during use. Furthermore, all conceivable combinations of the described embodiments are intended to be included by the invention.

5

## CLAIMS:

1. Absorbent article intended for female users, such as a sanitary napkin, a panty-liner or an incontinence protector, comprising a liquid-pervious surface layer (2), a liquid-impervious surface layer (3), and an absorbent body (4) enclosed between the two surface layers (2, 3), wherein the article further exhibits a wetting region (15), which is the region of the liquid-pervious surface layer which is intended to first be wetted by body fluid emitted to the article,  
c h a r a c t e r i z e d i n that the liquid-pervious surface layer (2) within the wetting region (15) is constituted of hydrophilic material (16), at least at the surface of the layer (2) which is intended to be facing the user during use, and that remaining parts of the liquid-pervious surface layer (2) are constituted of a hydrophobic material (14).
2. Absorbent article according to claim 1,  
c h a r a c t e r i z e d i n that the article exhibits a hump (317; 517), projecting from the liquid-pervious surface layer (302; 502), wherein the location of the hump (317; 517) on the article at least partially coincides with the wetting region (315; 515).
3. Absorbent article according to claim 1 or 2,  
c h a r a c t e r i z e d i n that the hydrophilic material (16) in the liquid-pervious surface layer (2) primarily consists of hydrophilic, absorbent fibres such as cellulose fibres, cotton, rayon, jute, peat moss, or the like.

4. Absorbent article according to claim 1 or 2,  
c h a r a c t e r i z e d i n that the hydrophilic  
material (16) in the liquid-pervious surface layer (2)  
primarily consists of hydrophilic, absorbent foam material,  
5 such as polyurethane foam, cellulose foam, or the like.

5. Absorbent article according to any one of the  
preceding claims,  
c h a r a c t e r i z e d i n that the hydrophobic  
10 material (14) in the liquid-pervious surface layer (2)  
primarily consists of hydrophobic fibres such as  
polypropylene fibres, polyethylene fibres, polyester  
fibres, or hydrophobic bi-component fibres.

15 6. Absorbent article according to any one of the  
preceding claims,  
c h a r a c t e r i z e d i n that the hydrophobic  
material (14) in the liquid-pervious surface layer (2)  
primarily consists of a hydrophobic foam material, such as  
20 polyethylene foam.

7. Absorbent article according to any one of the  
preceding claims,  
c h a r a c t e r i z e d i n that the liquid-pervious  
25 surface layer (2) comprises a laminate of a first liquid-  
pervious, hydrophobic material layer (14) arranged closest  
to the absorbent body (4), and a second liquid-pervious,  
hydrophilic material layer (16), of substantially the same  
extension as the wetting region (15) of the article,  
30 arranged outside the first material layer (14) and intended  
to bear on the body of the user in the wetting region (15)  
during use.

8. Absorbent article according to any one of claims 1-6,  
35 c h a r a c t e r i z e d i n that the liquid-pervious  
surface layer (302) comprises a laminate of a first liquid-

pervious, hydrophobic material layer (314), and a second liquid-pervious, hydrophilic material layer (316) arranged closest to the absorbent body (304), inside the first material layer (314), wherein the hydrophobic material layer (314) exhibits an opening, of substantially the same extension as the wetting region (315) of the article, through which the hydrophilic layer (316) is exposed.

9. Absorbent article according to claim 1 or 2, characterized in that the hydrophilic material (16) in the liquid-pervious surface layer (2) is constituted of a hydrophobic material which has been rendered hydrophilic.

10. Absorbent article according to claim 1 or 2, characterized in that the hydrophobic material (14) in the liquid-pervious surface layer (2) is constituted of a hydrophilic material which has been rendered hydrophobic.

11. Absorbent article according to any one of the preceding claims, characterized in that the article has such a shape and rigidity that it stays in position against the body of the user without the need for a special attachment means.

12. Absorbent article according to any one of the preceding claims, characterized in that the article is kept in position against the body of the user by means of a girdle or the like, which is detached from the panties.

13. Absorbent article according to any one of the preceding claims,

c h a r a c t e r i z e d i n t h a t t h e a r t i c l e c o m p r i s e s  
a s h a p i n g m e m b e r w h i c h , b y m e a n s o f i n f l u e n c e f r o m t h e  
f o r c e s w h i c h t h e a r t i c l e i s s u b j e c t e d t o d u r i n g u s e , h a s  
t h e a b i l i t y t o b r i n g t h e w e t t i n g r e g i o n ( 1 5 ) i n t o c o n t a c t  
5 w i t h t h e m u c o u s m e m b r a n e s o f t h e u s e r .

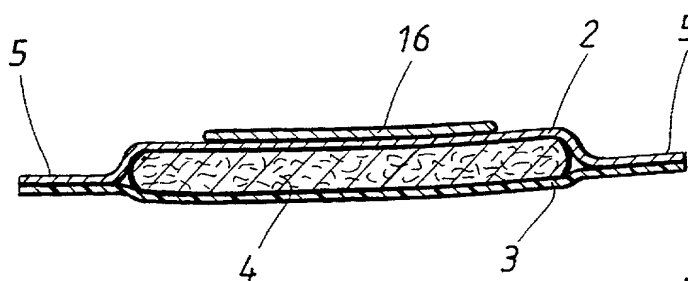
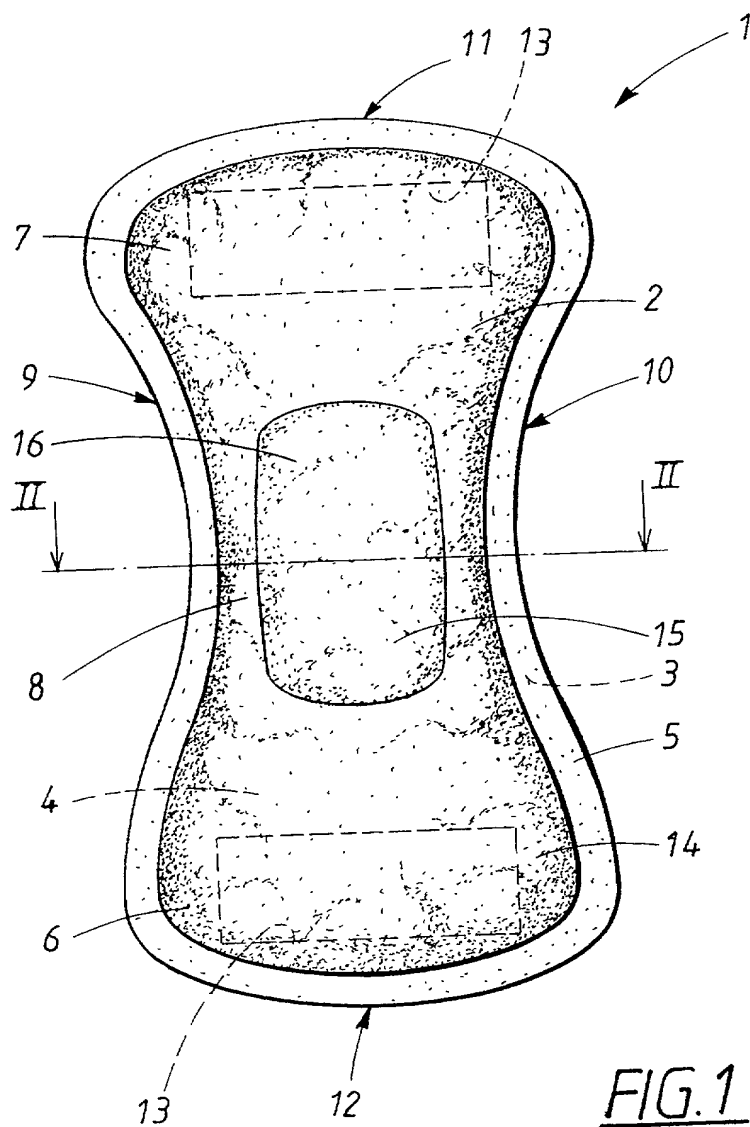
1 4 . A b s o r b e n t a r t i c l e a c c o r d i n g t o c l a i m 1 3 ,  
c h a r a c t e r i z e d i n t h a t t h e s h a p i n g m e m b e r i s  
c o n s t i t u t e d o f c o m p r e s s i o n s , f o l d i n g n o t c h e s , o r t h e l i k e .

10

1 5 . A b s o r b e n t a r t i c l e a c c o r d i n g t o c l a i m 1 3 ,  
c h a r a c t e r i z e d i n t h a t t h e s h a p i n g m e m b e r i s  
c o n s t i t u t e d o f a n i n s e r t .

15

1/3



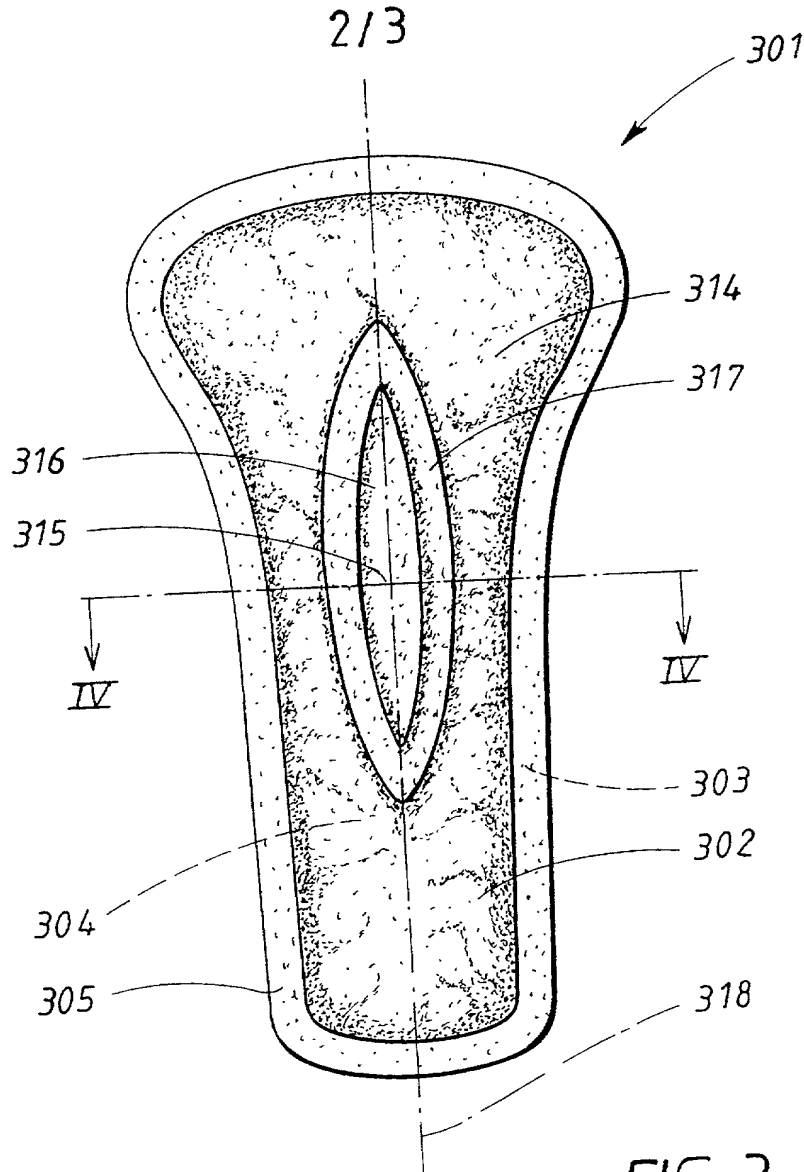


FIG. 3

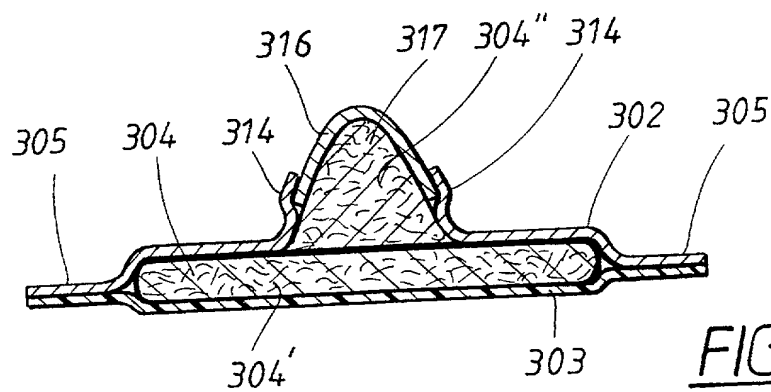
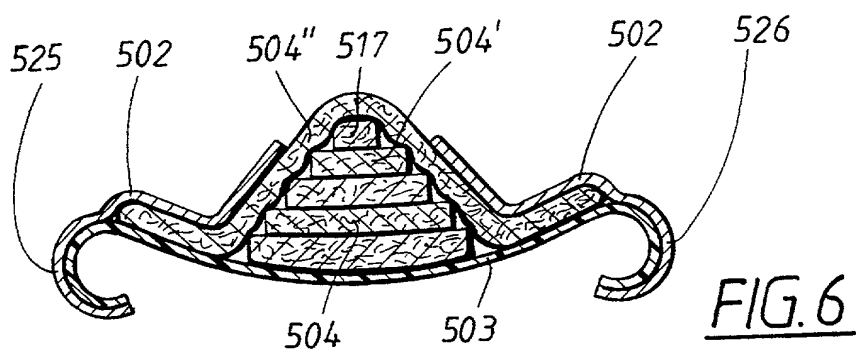
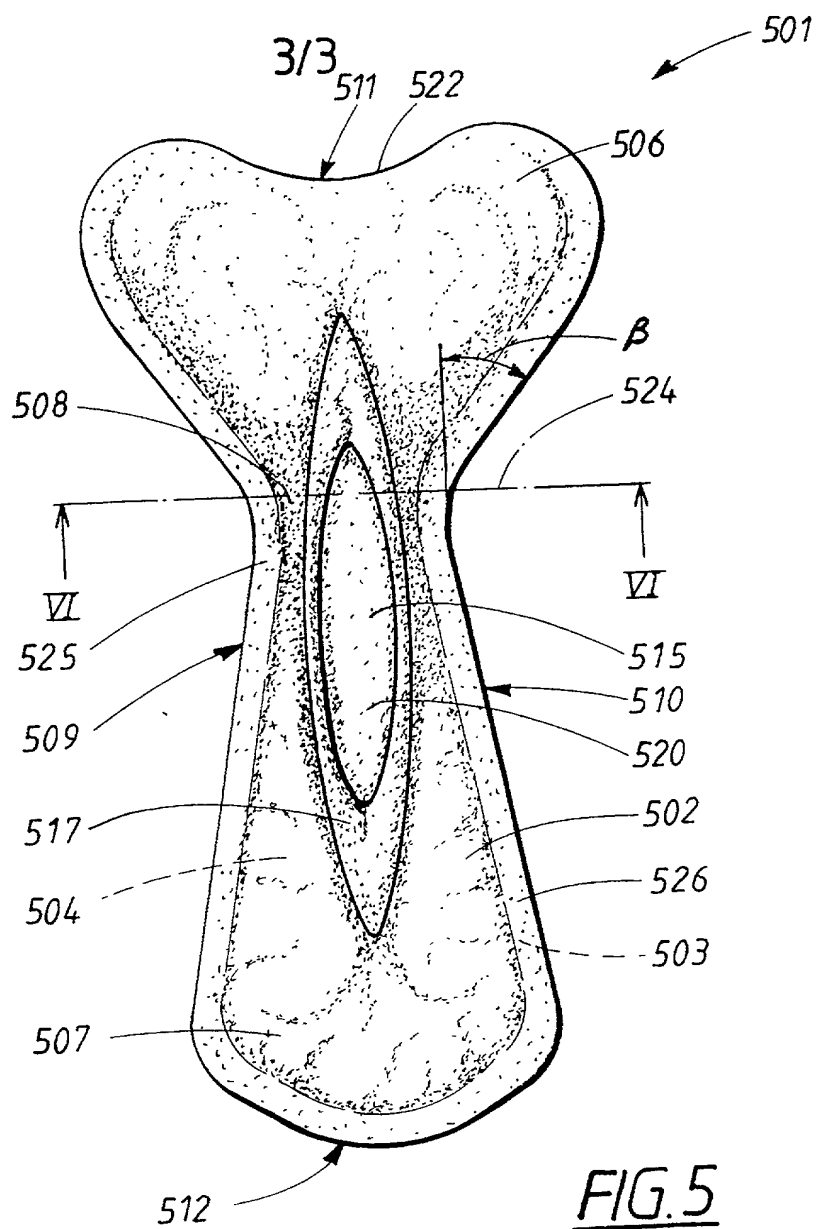


FIG. 4





COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY  
(Includes Reference to Provisional and PCT International Applications)

ATTORNEY'S DOCKET NUMBER

000515-141

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

ABSORBENT ARTICLE HAVING IMPROVED SURFACE PROPERTIES

the specification of which (check only one item below):

☐ is attached hereto.

☐ was filed as United States application

Number \_\_\_\_\_

on \_\_\_\_\_

and was amended

on \_\_\_\_\_ (if applicable).

☒ was filed as PCT international application

Number PCT/SE98/00187

on 3 February 1998

and was amended under PCT Article 19

on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(e) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119:

| COUNTRY<br>(if PCT, indicate "PCT") | APPLICATION NUMBER | DATE OF FILING<br>(day, month, year) | PRIORITY CLAIMED<br>UNDER 35 U.S.C. § 119 |
|-------------------------------------|--------------------|--------------------------------------|---|
| SWEDEN                              | 9700371-9          | 4 February 1997                      | <u>x</u> Yes ___ No                       |
|                                     |                    |                                      | ___ Yes ___ No                            |
|                                     |                    |                                      | ___ Yes ___ No                            |
|                                     |                    |                                      | ___ Yes ___ No                            |
|                                     |                    |                                      | ___ Yes ___ No                            |

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

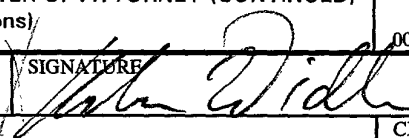
\_\_\_\_\_  
(Application Number)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Application Number)

\_\_\_\_\_  
(Filing Date)

|   |  |   |  |  |  |
|---|--|---|--|--|--|
| <b>COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONTINUED)</b><br>(Includes Reference to Provisional and PCT International Applications)  |  |   | <b>ATTORNEY'S DOCKET NO.</b><br>000515-141   |  |  |
| I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose to the Office all information known to me to be material to the patentability as defined in Title 37, Code of Federal Regulations §1.56, which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application: |  |   |  |  |  |
| <b>PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:</b>  |  |   |  |  |  |
| U.S. APPLICATIONS   |  |   | STATUS (check one)   |  |  |
| U.S. APPLICATION NUMBER   | U.S. FILING DATE   | PATENTED  | PENDING  | ABANDONED  |  |
|   |  |   |  |  |  |
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|   |  |   |  |  |  |
| PCT APPLICATIONS DESIGNATING THE U.S.   |  |   |  |  |  |
| PCT APPLICATION NO.   | PCT FILING DATE  | U.S. APPLICATION NUMBERS<br>ASSIGNED (if any)   |  |  |  |
| PCT/SE98/00187  | 3 February 1998  |   |  | x  |  |
|   |  |   |  |  |  |
|   |  |   |  |  |  |
| I hereby appoint the following attorneys and agent(s) to prosecute said application and to transact all business in the Patent and Trademark Office connected therewith and to file, prosecute and to transact all business in connection with international applications directed to said invention:   |  |   |  |  |  |
| William L. Mathis<br>Peter H. Smolka<br>Robert S. Swecker<br>Platon N. Mandros<br>Benton S. Duffett, Jr.<br>Norman H. Stepno<br>Ronald L. Grudziecki<br>Frederick G. Michaud, Jr.<br>Alan E. Kopecki<br>Regis E. Slutter<br>Samuel C. Miller, III<br>Ralph L. Freeland, Jr.<br>Robert G. Mukai  | 17,337<br>15,913<br>19,885<br>22,124<br>22,030<br>22,716<br>24,970<br>26,003<br>25,813<br>26,999<br>27,360<br>16,110<br>28,531 | George A. Hovanec, Jr.<br>James A. LaBarre<br>E. Joseph Gess<br>R. Danny Huntington<br>Eric H. Weisblatt<br>James W. Peterson<br>Teresa Stanek Rea<br>Robert E. Krebs<br>William C. Rowland<br>T. Gene Dillahunty<br>Patrick C. Keane<br>Bruce J. Boggs, Jr.<br>William H. Benz | 28,223<br>28,632<br>28,510<br>27,903<br>30,505<br>26,057<br>30,427<br>25,885<br>30,888<br>25,423<br>32,858<br>32,344<br>25,952 | Peter K. Skiff<br>Richard J. McGrath<br>Matthew L. Schneider<br>Michael G. Savage<br>Gerald F. Swiss<br>Michael J. Ure<br>Charles F. Wieland III<br>Bruce T. Wieder<br>Todd R. Walters | 31,917<br>29,195<br>32,814<br>32,596<br>30,113<br>33,089<br>33,096<br>33,815<br>34,040 |
| and: _____  |  |   |  |  |  |
| Address all correspondence to: <u>Ronald L. Grudziecki</u><br><u>BURNS, DOANE, SWECKER &amp; MATHIS, L.L.P.</u><br><u>P.O. Box 1404</u><br><u>Alexandria, Virginia 22313-1404</u>   |  |   |  |  |  |
| Address all telephone calls to: <u>Ronald L. Grudziecki</u> at <u>(703) 836-6620</u> .  |  |   |  |  |  |
| I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.   |  |   |  |  |  |

|   |  |   |                     |
|---|--|---|---------------------|
| COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONTINUED)<br>(Includes Reference to Provisional and PCT International Applications) |  | ATTORNEY'S DOCKET NO.<br>000515-181   |                     |
| FULL NAME OF SOLE OR FIRST INVENTOR<br>Urban WIDLUND  |  | SIGNATURE<br> | DATE<br>8 Feb. 1999 |
| RESIDENCE<br>Pixbo, SWEDEN  |  | CITIZENSHIP<br>SWEDISH  |                     |
| POST OFFICE ADDRESS<br>Päronvägen 5, S-435 43 Pixbo, SWEDEN   |  |   |                     |